Cambridge Assessment International Education

Cambridge O Level

MATHEMATICS (SYLLABUS D) **4024/22**

Paper 2 **May/June 2020**

MARK SCHEME

Maximum Mark: 100

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

[Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	6	**2**	**M1** for $\frac{22790-21500}{21500}[\times 100]$ oe or $\frac{22790}{21500}\times 100$ oe
1(b)	1354.5[0]	**2**	**M1** for $[1260+]\frac{3\times 2.5}{100}\times 1260$ oe
1(c)	63[.00] cao	**2**	**M1** for $\frac{4300}{67.8}$ soi
2(a)	$w+6+w+w+6+w=37$ oe	**M2**	**M1** for length $= w+6$
	6.25	**B1**	
2(b)	295.5	**3**	**B1** for two of 28.5, 15.5, 19.5, 7.5 **M1** for *their* $(28.5\times 15.5)-(19.5\times 7.5)$
3(a)	33.7 or 33.69…	**2**	**M1** for $\tan = \frac{8}{12}$ oe
3(b)	8.51 or 8.513…	**2**	**M1** for $\sin 70 = \frac{8}{QL}$ oe
3(c)	1.3	**2**	**M1** for $\frac{1.6}{TS}=\frac{8}{6.5}$ oe
4(a)(i)	15	**1**	
4(a)(ii)	Correct histogram	**3**	**B1** for three or more rectangles on correct base **B1** for three or more correct frequency densities soi

Question	Answer	Marks	Partial Marks
4(b)(i)	4.32 oe	**3**	**M2** for $\frac{1\times8+3\times16+5\times15+7\times7+9\times4}{8+16+15+7+4}$ or **M1** for $1\times8+3\times16+5\times15+7\times7+9\times4$ or $\frac{\sum fc}{8+16+15+7+4}$
4(b)(ii)	Correct cumulative frequency curve	**3**	**B2** for four or five correct points plotted or **B1** for correct cumulative frequencies soi
4(b)(iii)	4 to 4.2	**1**	
5(a)	Correct method to eliminate one variable	**M2**	**M1** for attempt to equate coefficients or attempt to make x or y the subject of one equation
	$x = 0.5$ oe, $y = -2.5$ oe	**A2**	**A1** for either $x = 0.5$ oe or $y = -2.5$ oe After A0, **SC1** for a pair of values that satisfy either equation or for correct answers with no working
5(b)	$2x^2 + 3x - 24 = 0$ oe	**B1**	
	$\frac{-3\pm\sqrt{3^2-4\times2\times-24}}{2\times2}$	**B2**	FT *their* 3-term quadratic **B1FT** for $\sqrt{3^2-4\times2\times-24}$ or for $\frac{-3\pm\sqrt{p}}{2\times2}$
	2.79, –4.29	**B1**	
5(c)(i)	$\frac{36}{g^3}$	**2**	**M1** for $h=\frac{k}{g^3}$ oe or $[k=]\ 4.5\times2^3$
5(c)(ii)	1.5 oe	**2**	**M1** for $g^3=\frac{their36\times3}{32}$ oe
6(a)(i)	0.2 or $\frac{1}{5}$ oe	**1**	
6(a)(ii)	23, 43, 53	**2**	**B1** for three correct and one incorrect or for two correct and none incorrect
6(a)(iii)	0.3 or $\frac{6}{20}$ oe	**2**	**B1** for $\frac{6}{k}$ where k is an integer > 6 or for 24, 32, 36, 52, 56 and 64 identified
6(b)(i)	35, 22, 38	**1**	

Question	Answer	Marks	Partial Marks
6(b)(ii)	$\frac{77}{200}$ or 0.385	**2**	**B1** for $\frac{46+31}{k}$ where k is an integer > 77 or **SC1** for $\frac{105}{200}$ or 0.525
6(b)(iii)	Large sample	**B1**	
	$\frac{46}{200}$ is a lot bigger than $\frac{1}{6}$ oe or $\frac{22}{200}$ is a lot smaller than $\frac{1}{6}$ oe	**B1**	
7(a)(i)	1, 2	**1**	
7(a)(ii)	Correct curve	**3**	**B2FT** for 6 or 7 points correctly plotted or **B1FT** for 4 or 5 points correctly plotted
7(a)(iii)	Tangent drawn at (2, 16)	**B1**	
	18 to 27	**B1**	Dependent on correct tangent or close attempt
7(a)(iv)(a)	$a = -60$, $b = 36$	**2**	**B1** for either correct or $3(4^x) - 60x + 36$ [= 0]
7(a)(iv)(b)	$y = 20x - 12$ ruled line	**M2**	**M1** for one correct coordinate soi
	0.7 to 0.8, 2.65 to 2.75	**B1**	
7(b)	$p = 1$	**B1**	
	$q = 9$	**B2**	**M1** for [y =] $(4 - x)(x + 2)$ oe or [y =] $q - (x - 1)^2$ oe or two correct equations in x and y using (–2, 0), (4, 0) or (0, 8) or **SC1** for $q = -9$
8(a)	376.99 to 377.04	**2**	**M1** for $\pi \times 10^2 \times$ figs12
8(b)	767 or 766.5 to 766.6…	**3**	**M2** for $\pi \times 10^2 + \pi \times 2 \times 10 \times (3 + 3 +$ figs 12) or **M1** for $\pi \times 10^2$ or $\pi \times 2 \times 10 \times (3 + 3 +$ figs 12)
8(c)	28.79 to 28.80…	**3**	**M2** for $200 = \frac{x}{360} \times \pi \times 10.3^2 \times 7.5$ or **M1** for $\frac{x}{360} \times k\pi$ used

Question	Answer	Marks	Partial Marks
9(a)	63	**B1**	
	$M\hat{L}N = 54$ angles on a straight line or $L\hat{M}N + M\hat{N}L = 126$ exterior angle of a triangle	**B1**	
	$M\hat{N}L = 63$ or $N\hat{M}L = 63$ angles in isosceles (triangle)	**B1**	
	$M\hat{N}L = F\hat{M}N$ alternate angles or $G\hat{L}M = L\hat{M}F$ alternate angles or $E\hat{M}L = 54$ co-interior with $G\hat{L}M$ (or alternate with $M\hat{L}N$) and angles on a straight line	**B1**	
9(b)(i)	$\frac{y}{2}$ oe	**1**	
9(b)(ii)	x	**1**	
9(b)(iii)	$90 + x$ oe	**2**	FT $90 +$ *their* (a)(ii) **B1** for $B\hat{A}C = 90°$ or $B\hat{D}C = 90°$
9(b)(iv)	$90 - x - \frac{y}{2}$ oe	**1**	
10(a)	$FC^2 = \left(\frac{10}{2}\right)^2 + \left(\frac{6}{2}\right)^2$ oe or $EX^2 = 12^2 - \left(\frac{6}{2}\right)^2$ or $EY^2 = 12^2 - \left(\frac{10}{2}\right)^2$	**M2**	**M1** for $AC^2 = 10^2 + 6^2$ oe or $EX^2 + \left(\frac{6}{2}\right)^2 = 12^2$ or $EY^2 + \left(\frac{10}{2}\right)^2 = 12^2$
	$\left[EF^2 =\right] 12^2 - \textit{their}\, FC^2$ oe or $\left[EF^2 =\right] \textit{their}EX^2 - \left(\frac{10}{2}\right)^2$ or $\left[EF^2 =\right] \textit{their}EY^2 - \left(\frac{6}{2}\right)^2$	**M1**	Dep on M2
	10.49 or 10.488…	**A1**	
10(b)	210 or 209.7 to 209.8	**2**	**M1** for $\frac{1}{3} \times 6 \times 10 \times 10.5$

Question	Answer	Marks	Partial Marks
10(c)	29.0 or 28.95 to 28.96	**3**	**M2** for [cos =] $\frac{12^2+12^2-6^2}{2\times12\times12}$ or $2\sin^{-1}\left(\frac{3}{12}\right)$ or **M1** for $6^2 = 12^2 + 12^2 - 2\times12\times12\cos E$ or $\sin = \frac{3}{12}$
10(d)	34.9 or 34.85 to 34.86	**2**	FT 72sin(*their* (c)) **M1** for $\frac{1}{2}\times12\times12\times\sin(\textit{their } 29.0)$ or $\frac{1}{2}\sqrt{12^2-3^2}\times6$ oe
11(a)	Reflection $y = -1$	**2**	**B1** for either
11(b)	$\begin{pmatrix}0 & -1\\ 1 & 0\end{pmatrix}$	**2**	**B1** for one correct row or column or Rotation, 90° anticlockwise about (0, 0)
11(c)	Triangle with vertices (–1, –2) (0, –2) (0, –5)	**3**	**B2** for triangle with correct orientation but wrong position or **B1** for triangle reflected in $x = 2$ After 0, **SC1** for triangle with vertices (–3, –2) (–4, –2) (–4, 1)